ENGINEERING

Regional Supervisor
Branch of Wildlife Refuges

March 29, 1963

EH-R Tewaukon
Water Management Plan

Regional Engineer

Tewaukon NWR, North Dakota - 1963 Proposed Annual Water Management Plan

We have reviewed the subject report and concur in the proposed management plan.

Although streamflow for the area was considerably above median last year and continued so through the winter, lack of snow and below normal precipitation could lead to a low flow year in 1963.

We wish to make the following comments regarding the statements on refuge inflow and outflow by the refuge manager:

Stephan 3/29/63

Doeling 3/29

1) The July 12, 1962, 290 cfs flow for Cayuga listed in the Tewaukon master plan was from a U.S.G.S. flow measurement made on that date. At the time the hydrological data was prepared current year flow information was limited, consequently the discrepancy in readings. It is interesting to note that the peak flow was much higher than originally believed.

2) We consider the manager's 1962 estimate of refuge outflow to be too high based on the consideration of drainage areas involved. We are enclosing a copy of a letter from the Geological Survey, May 14, 1962, showing pertinent information for the area. For uniform runoff it would be better to assume a straight line relationship between drainage area and volume of runoff recorded.

JDU 3/29

In 1962 this would reduce Tewaukon outflow to:

$$\frac{661}{955} \times 52,315 = 36,200 \text{ acre-feet}$$

3) In future annual water management plans we desire the refuge manager to submit only the U.S.G.S. monthly flow figures for Cayuga and Rutland under "Inflow and outflow" data. It will not be necessary to estimate inflow or outflow this way. If the Geological Survey data cannot be obtained readily then no information need be submitted under this heading.

We have not been receiving monthly records of gauge readings. Copies of Form 3-1547 were furnished the refuge manager with our memorandum of May 28, 1962. This memo provided information for setting staff gauges. In it we asked the manager to keep record of the gauge readings for each station on a separate sheet.

extra cps (2) attd.
CWStephan:ELDoeling:rj

John D. Umberger

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A. .AL WATER PROGRAM - TEWAUKON RE. .E

I. 1962 Water Use Data.

IMPOUNDMENT DATA

Lake Tewaukon for Calendar Year 1962

Month	Inches below or Above spillway (ave.)	Elevation	Area (acres)	Capacity (acre-feet)
Jan.	18 below	1145.50	1,032	5,676
Feb.	18 below	1145.50	1,032	5,676
Mar.	6 below	1146.33	1,032.6	6,536
Apr.	3 above	1147.25	1,033.2	7,490
May	10 above*	1147.83	1,034	8,096
June	4 above	1147.33	1,033.5	7,576
July	2 above	1147.16	1,033	7,396
Aug.	0	1147.00	1,033	7,231
Sept.	1 below	1146.92	1,033	7,148
Oct.	3 below*	1146.75*	1,033	6,972
Nov.	3/4 above*	1147.06*	1,033	7,293
Dec.	1½ above*	1147.12*	1,033	7,303

Cutler Marsh for Calendar Year 1962

Month	Inches below or above spillway (ave)	Elevation	Area (acres)	Capacity (acre-feet)
Jan.	26 below	1146.98	128	384
Feb.	26 below	1146.98	128	384
Mar.	20 below	1147.49	155	620
Apr.	3 above	1149.39	195	585
May	6 above	1149.64	200	600
June	12 above*	1150.14	215	645
July	10.5 above*	1150.00	215	645
Aug.	3.25 above*	1149.40	207	621
Sept.	1 above	1149.22	205	615
Oct.	1.5 above	1149.26	205	615
Nov.	2.5 above*	1149.36	206	618
Dec.	20 below*	1147.49	155	405

Clouds Lake for Calendar Year 1962

Month	Inches below or above spillway (ave)	Elevation	Area (acres)	Capacity (acre-feet)
Jan.	36 below	1174.76	100	250
Feb.	36 below	1174.76	100	250
Mar.	30 below	1175.26	100	300
Apr.	6 above	1178.26	100	600
May	3 above	1178.01	100	575
	Gauge Readings (ave)			
June	7.99*	1177.99*	101	581
July	8.10*	1178.10*	101	585
Aug.	7.60*	1177.60*	101	545
Sept.	7.10*	1177.10*	101	480
Oct.	7.05*	1177.05*	101	479
Nov.	6.80*	1176.80*	101	455
Dec.	6.75*	1176.75*	101	454

* - Figures not estimated

Refuge Inflow and Outflow

The only data available for the inflow into the refuge is from a stream flow gauge located on the Wild Rice River south of Rutland, North Dakota, between the main unit of Tewaukon Refuge and the Sprague Lake Unit. This gauge is operated by the U.S.G.S. They also operate a gauge on the Wild Rice River near Cayuga, North Dakota, downstream five miles from the refuge. This gauge gives some indication of the outflow.

For the months January through September the upstream gauge showed a discharge of 11,961 acre feet. We have estimated the total discharge for the year at this point to be 13,244 acre feet. The downstream gauge shows a discharge of 52,183 acre feet for the period January through September. We have estimated that the total discharge for the year to be 52,315 acre feet.

The explanation for the much larger discharge downstream is the addition of several other intermittent streams that enter the Wild Rice River from the south. The watershed of these streams is very large and at times considerable water is passed into the Wild Rice River between the Rutland gauging station and the Cayuga station.

Too High!

Using this data the refuge inflow is estimated at 54,000 acre feet. The outflow of course is approximately the same as the discharge at the Cayuga gauging station or 52,315 acre feet.

This is much more inflow than any year on record. The previous maximum discharge at Rutland was 102 cfs on April 15, 1960. This year it was 125 cfs on July 6. Although the Tewaukon Master Plan lists the record high for the Cayuga station to be 390 cfs on July 12, 1962, the most recent records from the U.S.G.S. show it to be 766 cfs on July 7, 1962. The inflow this year was also of much longer duration due to heavy summer rains.

USGS Inst. Rec.

Summary of 1962 Water Program

Water Levels.

Water levels on the refuge are best expressed by the local statement, "highest since 1916". Following the drought conditions of 1961 the refuge pools were quite low with Lake Tewaukon 18 inches below spillway, Cutler Marsh 26 inches below, and Clouds Lake down 36 inches at the beginning of the period. With the spring run-off the pools quickly filled to capacity with all pools overflowing in late March or early April. This overflow condition was maintained by spring rains until late summer.

Lake Tewaukon dropped slightly below spillway level in September and October with evapo-transpiration losses. Then with additional

inflow from the Wild Rice River it again reached capacity. This was added to by the drawdown waters from Cutler Marsh and at the end of the period it just tops spillway level.

Cutler Marsh topped spillway level until the drawdown commenced on November 15th. At the close of the period it is at the same level as Lake Tewaukon.

Clouds Lake for the first time in years reached spillway level in April though it was 36 inches below spillway level at the beginning of the period. This over capacity condition continued until late July. Evapo-transpiration losses have reduced levels to 12 inches below spillway at the end of the period.

Food Supplies.
Aquatic food plants in Lake Tewaukon remainded scarce throughout the period. There were scattered patches of submergents but very little change from other years.

Cutler Marsh aquatic food growth compared to the abundance of 1960. Sago pondweed was the primary submergent food plant. Clouds Lake had fair growth of submergents. Mud Slough was 50% covered with Sago pondweed and other submergents. White Lake had good growth in the west end but carp hampered favorable conditions in the east potion. All smaller wetlands had almost optimum growth of both emergent and submergent aquatics.

Waterfowl Use.
All areas except White Lake had good waterfowl utilization. Cutler Marsh was very popular with feeding and resting ducks, and had some use by resting geese late in the fall. Mud Slough and Clouds Lake were well utilized by resting geese and some mallards used Clouds Lake during the fall. Lake Tewaukon also served as a resting area for both ducks and geese.

Because of their ideal water conditions the smaller wetlands were by far the most popular as both feeding and resting areas. They were also the most important from the standpoint of waterfowl production as they were used as courtship areas, as territorial areas, and brood rearing ponds. The small potholes in the preferred feeding areas were also utilized by geese. The waterfowl use of these small areas, when water conditions are right, proves that the development of these small wetlands would be worthwhile.

Vegetation Control.
The strips that were sprayed with Amitrol T. in the fall of 1961 have shown favorable results. In Cutler Marsh no new cattail growth was observed while in White Lake the cattail had died out

but the roundstem bulrush still remained. All sprayed strips were mowed in December of 1962 to eliminate the standing dead vegetation.

The drawdown of Cutler Marsh combined with a good freeze and no snow cover has allowed us to mow several new strips in unsprayed cattail growth at two feet below spillway level. Half of these strips will be sprayed with Amitrol T and the other half will be left unsprayed to give us a comparison of spraying, mowing and flooding as compared to mowing and flooding.

In White Lake several new strips have also been mowed. Half will be sprayed. In the unsprayed areas the growth is expected to be stimulated since no flooding is possible in White Lake. However, all of the combinations should give us some indication of which is the best control in this area. At this point, spraying only, seems the most feasible and the most successful.

II. 1963 Water Program.

Maintain all pools at full capacity. If a drawdown is desired in Cutler Marsh for mechanical control of vegetation, it will be requested in the fall of 1963. This drawdown may also be required in preparation for development work proposed for early 1964.

Additional water gauges will be installed in Cutler Marsh, White Lake and Lake Tewaukon.